March 12, 2002

Changes in the Composition of Labor for BLS Multifactor Productivity Measures, 2000

Characteristics of workers evolve over time. Each succeeding generation has completed more years of schooling than the one before. Women have entered the work force in increasing numbers since the late 1950s, continuing a trend seen throughout this century. The large baby boom cohort entered middle age during the 1980s and 1990s, and is now a dominant force in the labor market. Consequently, middle-aged workers have come to account for an ever-larger share of total hours worked, and the average age of workers has risen. Furthermore, the United States economy has recently completed its longest economic expansion in history. Because of this strong labor market, employers have been recruiting more workers with fewer skills and older workers have remained on the job.

As a result of these changes, the work force in 2000 was very different from the work force in 1948. And the skill-composition of hours worked today, as measured by a worker's education and work experience, is very different from the distribution of hours worked by level of skill in 1948.

The BLS labor composition index estimates the effect of shifts in the experience, education, and gender composition of the work force on the efficiency of labor, and multifactor productivity growth. The Office of Productivity and Technology assembles data on workers' hours classified by their educational attainment, age and gender. Measures of labor input for private business and private nonfarm business are then calculated by summing the annual percent changes in each group's hours of work, each weighted by that group's share of total labor compensation. These BLS labor composition indexes are reported annually in the Multifactor Productivity Trends news release. A complete description of these measures and methods can be found in Bulletin 2426, Labor Composition and U.S. Productivity Growth, 1948-90.

Recent Changes in Labor Composition

Based on data from the March 2000 Current Population Survey (CPS) of households, the labor composition index for 1999 increased at the following rates:

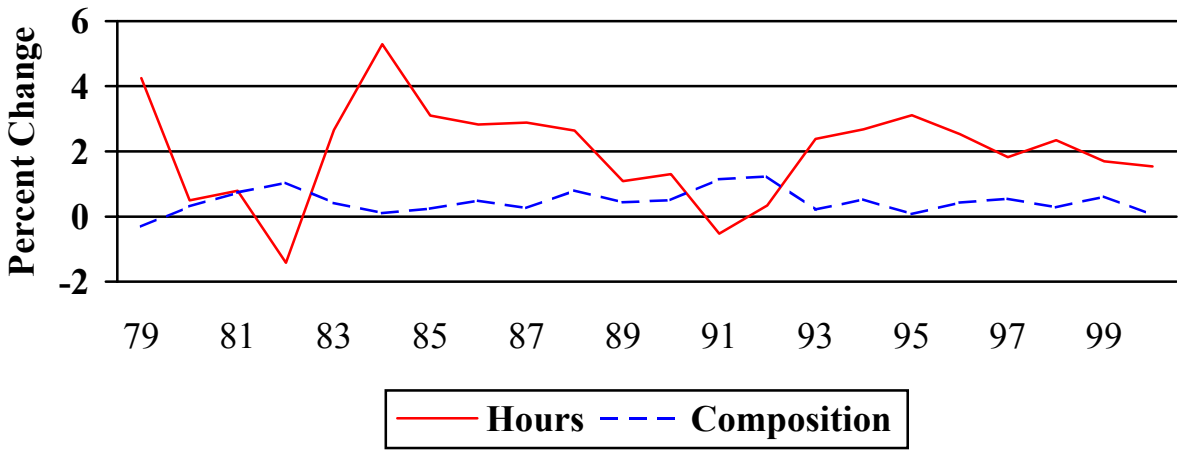
Sector	1999-2000
Private business	0.05%
Private nonfarm business	0.04%

Charts 1 and 2 show annual changes in the index of labor composition and hours for the private business sector and the private nonfarm business sector since 1979. The rates of growth for the private business and private nonfarm business sectors are very similar because the two sectors cover approximately the same portions of the economy. Private nonfarm business excludes hours in the farm sector from private business, and the farm sector comprises 2 percent of the hours in the total economy. Therefore changes in the composition of hours are virtually identical in the two sectors. For this reason, the private nonfarm business sector is not discussed further.

The 0.05% increase in the labor composition index for the private business sector was the smallest increase since 1979 when labor composition declined. Since 1979, labor composition in private business has accounted for nearly 25 percent of the increase in labor input. Within a growth accounting framework, a 1-percent change in the labor composition index indicates that increases in workers' skill levels have had the same effect on output and productivity growth as a 1-percent change in hours worked.

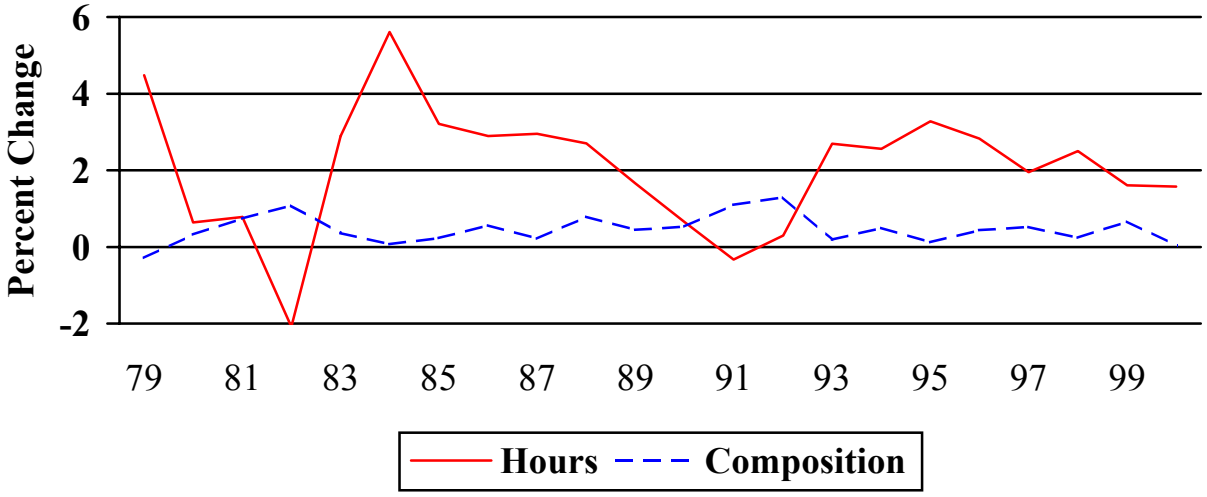
Table 3 (at the end of this document) divides the sources of labor input growth for the private business sector. While annual changes in labor input as measured by the Current Population survey are dominated by changes in hours, labor composition growth provides a small but steady positive contribution to labor input even in recessions. As a result, labor composition contributes about 20 percent of labor input growth over the 1948-2000 period.

Chart 1. Changes in the index of labor composition and hours in private business, 1979-2000



Hours and labor composition are based on the March annual demographic file of the Current Population Survey.

Chart 2. Changes in the labor composition index and hours in private nonfarm business, 1979-2000



Hours and labor composition are based on the March annual demographic file of the Current Population Survey.

To better understand why these changes are occurring, it is useful to examine changes in educational attainment and work experience within the employed work force. Hours-weighted average levels of educational attainment increased at a fairly steady pace until 1994. In 1995 and 1996, educational attainment failed to advance. Since then it has resumed its upward trend, although at a slower pace than previously. In 2000, average schooling did not increased for men and continued on its slower pace of advance for women. Work experience levels increased rapidly throughout the 1996-99 period, due largely to the aging of the baby boom cohort. In 2000, work experience rose at a considerably slower pace for men and did not rise at all for women.

As can be seen in the charts above, cyclical effects are also evident in the labor composition index. For example, labor composition index growth rates greater than 1 percent appear in the charts only in the recession years 1982 and 1991-1992. At the beginning of an economic recession, firms generally lay off workers with the least seniority ("last-hired first-fired"). Blue-collar workers usually experience more layoffs than well-educated white-collar workers do. Conversely, economic expansions begin by re-employing many blue-collar workers. As the expansion continues, firms often hire workers with lesser qualifications and workers who were not previously in the labor force. Therefore it is typical for an index of labor composition to increase relatively rapidly during recessions and relatively slowly as economic expansions mature. The eighth year of economic expansion, 2000, appears to be typical of this pattern as labor composition barely advanced.

The role of experienced workers within the current composition of the work force can also be seen in tables on employment, hours, and median weekly earnings that are published by broad age intervals in the Bureau of Labor Statistics publication Employment and Earnings. Compared with overall average growth rates in 2000, these tables show employment declined for prime age workers 25-44 years old. Employment gains were primarily limited to workers age 20-24 and 45-54. Gains in educational attainment were the only source of the meager labor composition growth in 2000 while changes in work experience negligibly slowed labor composition growth.

Changes in the Distribution of Hours

Table 1 below shows the distribution of hours of men in the private business sector by educational attainment. The general pattern of an increasing share of hours worked by more educated workers is less clear in 2000. The share of hours declined sharply for those with post-graduate schooling while men with 13-16 years of schooling increased their share of hours modestly. The share of hours worked by men with 9-11 years of schooling continued to decline, but men with 0-8 years of schooling maintained their share of hours. The share of hours worked by men with a high school diploma has been generally declining, but in 2000 their share increased. The hours-weighted average level of educational attainment for men increased from 13.3 to 13.4 years between 1996-1999. In 2000, this measure of schooling attainment for men remained unchanged at 13.42 years perhaps reflecting the improved opportunities for less skilled workers.

Table 1. Distribution of hours by years of school completed
Men and women in private business 1996-2000
(Percent)

Years	Men					Women				
	1996	1997	1998	1999	2000	1996	1997	1998	1999	2000
0-4	0.95	0.96	0.82	0.89	0.92	0.43	0.51	0.51	0.54	0.57
5-8	3.71	3.40	3.34	3.40	3.35	2.09	2.09	2.04	2.09	2.18
9-11	8.11	7.82	7.76	7.45	7.20	6.46	6.26	6.62	6.37	6.37
12	34.33	34.81	34.50	33.86	33.98	36.69	35.84	35.33	34.51	33.79
13-15	26.03	25.99	25.89	26.25	26.41	31.21	31.54	31.65	32.19	31.96
16	18.05	18.17	18.96	18.90	19.16	17.41	17.59	17.84	18.15	18.78
17+	8.81	8.85	8.74	9.26	8.98	5.71	6.17	6.01	6.16	6.34
Mean	13.31	13.34	13.38	13.42	13.42	13.38	13.42	13.41	13.45	13.47

Sum over all schooling levels in each year equals 100 for men and for women.

Among women, the consistent trend has been for college educated women to increase their share of hours, and this trend prevailed again in 2000. From 1996-99, there has been an increase in the share of hours worked by women with at least some college education at the expense of high school graduates and dropouts. In 2000, only women with at least a college degree increased their share of hours. The small group of women with less than 9 years of schooling also increased their share slightly. The erosion of hours worked by women with a high school diploma continued. Breaking with past trends of steady increases, the share of hours worked by women with some college declined in 2000. The net result was that hours-weighted average schooling levels for working women increased slightly in 2000.

Table 2 shows distributions of hours by level of potential work experience, defined as age minus years of completed schooling minus 6. The final row of table 2 shows that the mean years of potential experience rose slowly for men while the average did not rise for women for the first time in 15 years.

These changes reflect long term demographic changes as well as the improved job prospects of younger less skilled workers. The share of hours worked by the original baby boom generation continues to rise in large part because the population of this cohort (aged 35-54) increased 1.6 percent in 2000 or at a rate nearly twice as fast as the remainder of the population. This most closely corresponds to workers with 20-29 years of potential experience as seen in table 2. For men and for women, workers with 20-29 years of potential experience increased their share more than a third of a percentage point

Inexperienced workers now include some of the children of the baby boom cohort, sometimes designated the "baby boom echo." The population of 16-19 year olds was essentially unchanged which would suggest a decline in their share of hours. However, employment increased faster for this group than for the rest of the work force as labor force participation rates increased and unemployment rates declined. As a result, the share of hours worked by women with less than 5 years of potential experience jumped while the men's share remained unchanged.

Table 2. Distribution of hours by years of potential experience
Men and women in private business, 1996-2000
(percent)

Years	Men					Women				
	1996	1997	1998	1999	2000	1996	1997	1998	1999	2000
0-4	11.64	11.49	11.72	11.70	11.69	14.96	14.65	14.85	14.81	15.33
5- 9	13.03	12.52	12.32	12.01	12.07	12.75	12.66	12.68	12.17	11.95
10-14	14.24	13.73	13.48	13.25	12.85	12.77	12.76	12.38	12.19	11.66
15-19	15.14	15.34	14.63	14.54	14.04	14.31	13.68	13.72	13.42	13.43
20-29	25.36	26.35	26.75	27.17	27.54	24.74	25.32	25.26	26.04	26.38
30-39	14.12	14.25	14.68	14.61	15.22	14.41	14.84	15.19	15.21	15.23
40+	6.47	6.30	6.43	6.72	6.59	6.05	6.08	5.92	6.16	6.02
Mean	19.27	19.40	19.53	19.72	19.83	18.69	18.85	18.84	19.06	19.06

The sum over all experience levels in each year equals 100 for men and for women. Potential experience represents the number of years since leaving school (age-schooling-6).

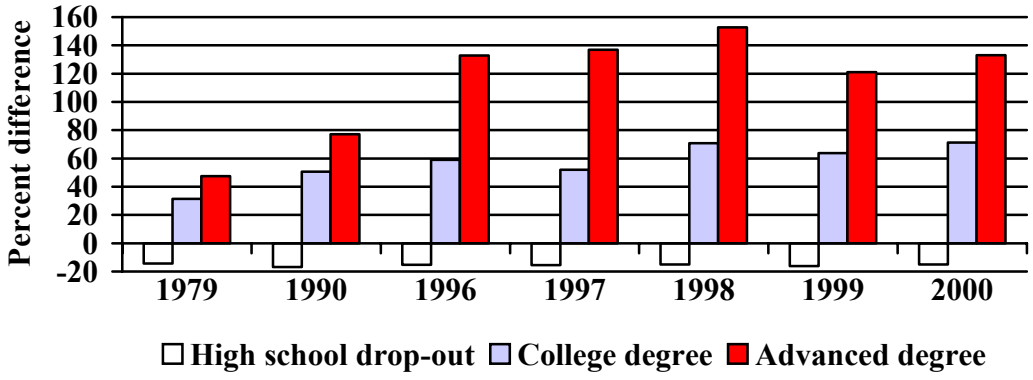
Furthermore, the population aged 55 and older grew nearly as rapidly as the baby boom generation. The labor force participation rate for workers aged 55 or more held steady and unemployment rates declined slightly in 2000. For those with 30-39 years of experience, their share of hours rose sharply for men but was essentially unchanged for women. For workers with 40 or more years of potential experience, their share declined about .15 percentage points.

Wage Equation Estimates

The labor composition index is affected by both shifts in the distribution of hours employed and by changes in the relative wage rates received by different groups of workers. For example, suppose that the total hours of highly educated workers are growing more rapidly than the hours of less educated workers. Then, all else equal, an increase in the wage rates of highly educated workers relative to less well-educated workers will result in an increase in the growth rate of the labor composition index. Many studies have shown that returns to schooling and work experience increased throughout the 1980s and early 1990s. These trends are reflected in wage equation parameters that are used to construct the labor composition index.

As noted above, the BLS labor composition indexes are weighted sums of growth rates of hours. A standard human capital wage equation is used to construct the labor cost share weights used in these calculations. Relative earnings by educational attainment based on these parameters are found in the following charts. These parameter estimates capture the wage rate differentials between different categories of workers. Using high school graduates as a reference group, male college graduates, for example, earned approximately 71 percent more than otherwise identical high school graduates while high school drop-outs earned about 15 percent less in 2000. (See Chart 3.)

Chart 3. Earnings of men by educational attainment relative to high school graduates

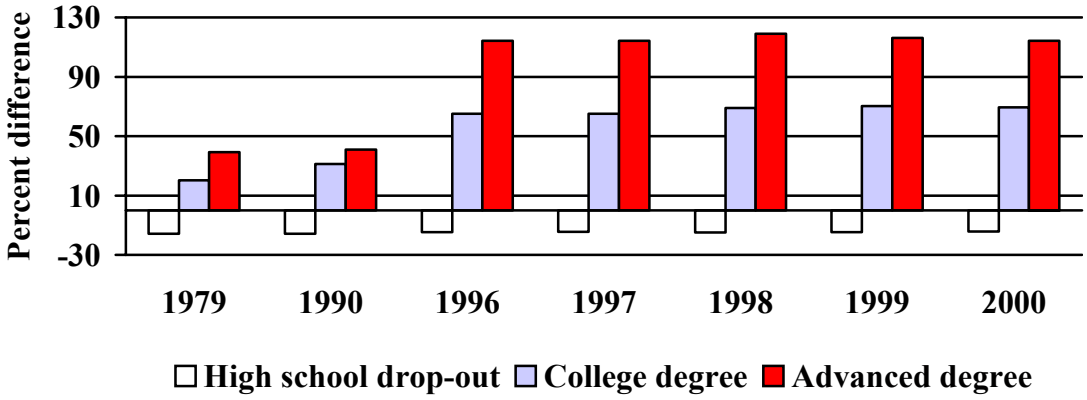


Relative earnings of employees in the private business sector are measured holding all other socioeconomic characteristics constant. Data are based on the March annual demographic file of the Current Population Survey.

While the relative earnings of more educated workers have been rising since the late 1970s, there had been no discernible trend between 1996 and 2000. The relative earnings of well-educated men appeared to rise slightly in 2000 for both men with college degrees and advanced degrees.

For women, no change in relative earnings is apparent. The earnings of college graduates in 2000 were about 70 percent higher than those of high school graduates and earnings of women with advanced degrees were 114 percent higher. This represents a negligible drop from 1999. (See Chart 4.)

Chart 4. Earnings of women by educational attainment relative to high school graduates



Relative earnings of employees in the private business sector are measured holding other socioeconomic characteristics constant. Data are based on the March annual demographic file of the Current Population Survey.

Work experience parameters can be interpreted in a similar fashion, although the exact calculations are slightly more complex. Estimated work experience is modeled using the characteristics of workers and their work histories taken from a sample of Social Security Administration records (see Bulletin 2426, Labor Composition and U. S. Economic Growth, 1948-90). For 2000, men with 5 years of estimated work experience earn 30 percent more than men with no estimated work experience. Men with 25 years of work experience earn nearly 125% more than inexperienced workers. At some point, additional experience ceases to have any positive effect, and wages may cease to increase or fall for some older workers because of job changes, career changes or other reasons. Thus, on average, workers nearing retirement often have somewhat lower wage rates than those in their late 40s. Chart 5 indicates that men with 35 years of work experience earn more than twice as much as new entrants but less than those with 25 years of work experience.

Chart 5 also shows a compression in the relative earnings of men with different amounts of estimated work experience over the last 5 years. While men with 5 years of work experience continue to earn almost 35 percent more than inexperienced workers, the premium paid to workers with 35 years of experience has steadily declined especially in the tight labor markets of 1999 and 2000. The premium paid the men with 15 or more years of work experience has declined about 10 percent since 1998.

Chart 5. Earnings of men by years of estimated work experience relative to inexperienced workers, 1979-2000

Relative to earnings of employees in the private business sector with no experience are measured holding other socioeconomic characteristics constant. Data are based on the March annual demographic file of the Current Population Survey.

For women, estimated work experience has less impact on earnings. Furthermore, over the last 5 years the return to work experience does not appear to be falling. (See Chart 6.) In 2000, women with 5 years of work experience earned about 37 percent more than women without any experience. While this is a small increase over 1999, in the previous 4 years the premium averaged about 33 percent. A similar increase occurred in 2000 for women with 15 years of experience who earned about than 84 percent more than inexperienced female workers. Again, this is slightly higher than in the previous 4 years when women earned about an 80 percent premium. For the most experienced workers, women with 25 years, the wage premium fell in 2000 to about 59 percent compared to about 67 percent in the previous 4 years.

Chart 6. Earnings of women by years of estimated work experience relative to inexperienced workers, 1979-2000

Relative to earnings of employees in the private business sector with no experience are measured holding other socioeconomic characteristics constant. Data are based on the March annual demographic file of the Current Population Survey.

Over the last five years, the wage pattern for all workers exhibits little change across education groups. This contrasts with the growing returns to education between 1979 and 1996 especially for college educated workers. The returns to work experience for men compressed between 1996 and 2000 especially in the last two years. For women, changes in relative earnings by work experience between 1996 and 2000 were without trend unlike the substantial increase in the returns to work experience between 1979 and 1996.

Summary and Conclusions

In 2000, the labor composition index for private business increased 0.05 percent, and it increased 0.04 percent in private nonfarm business. These gains were the smallest in more than 20 years. Labor composition tends to grow more slowly toward the end of the business cycle as employers find it increasingly difficult to find highly qualified workers and this appears to be the case in 2000. Small shifts in hours toward more highly educated workers were the only source of the labor composition growth.

Table 3. Sources of labor input growth in private business, 1949-2000

(Percentage change)

Year	Labor Input[1,2]	Hours[1]	Labor Composition
1949	-1.41	-1.62	0.21
1950	-2.02	-2.78	0.76
1955	2.47	2.29	0.18
1960	-0.33	-0.84	0.51
1961	0.92	0.37	0.55
1962	1.27	0.33	0.94
1963	0.79	0.57	0.22
1964	1.43	1.38	0.05
1965	1.54	1.64	-0.10
1966	0.60	0.62	-0.02
1967	0.86	0.70	0.16
1968	1.32	1.55	-0.23
1969	1.32	0.97	0.35
1970	-1.48	-1.94	0.46
1971	2.47	2.77	-0.30
1972	3.68	3.63	0.05
1973	2.10	2.29	-0.19
1974	-4.96	-5.60	0.64
1975	2.31	2.27	0.04
1976	3.64	3.90	-0.26
1977	4.59	4.56	0.03
1978	4.88	4.77	0.11
1979	3.94	4.25	-0.31
1980	0.81	0.50	0.31
1981	1.52	0.78	0.74
1982	-0.39	-1.42	1.03
1983	3.07	2.65	0.42
1984	5.40	5.29	0.11
1985	3.34	3.10	0.24
1986	3.31	2.82	0.49
1987	3.14	2.88	0.26
1988	3.42	2.63	0.79
1989	1.52	1.08	0.44
1990	1.81	1.30	0.51
1991	0.62	-0.52	1.14
1992	1.57	0.34	1.23
1993	2.59	2.38	0.21
1994	3.20	2.67	0.53
1995	3.19	3.11	0.08
1996	2.96	2.53	0.43
1997	2.37	1.82	0.55
1998	2.62	2.34	0.28
1999	2.31	1.69	0.62
2000	1.58	1.53	0.05

1. Labor input and hours growth rates are based on data from the Current Population Survey. These growth rates are not the measures used in the calculation of multifactor productivity.

2. The growth rate of labor input equals the growth rates of hours and labor composition.